Verification and Validation of Modeling and Simulation and the SIE in Support of Testing

Presented for:

MCSC Round Table

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Prepared by:

Mr. Pete Christensen

Assistant Scientific Advisor

MCOTEA

Christensenph@nt.quantico.usmc.mil

Outline

- What are M&S and VV&A?
- Key DOD and SECNAV M&S Guidance
- SECNAVINST 5200.40
- MCOTEA Leverages Acquisition Products and Developmental Testing (DT)
- Example: Interoperability Testing and the SIE
- MCOTEA Concerns
- Notional VV&A Roles and Responsibilities
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What are M&S and VV&A?

- **M&S: The use of models and simulations, either statically or over time, to develop data as a basis for making managerial or technical decisions.**
  - ***This includes but is not limited to, emulators, prototypes, simulators, and stimulators***

- **Verification: "The process of determining that a model or simulation *faithfully represents the developer's conceptual description and specifications*. Verification evaluates the extent to which the model or simulation has been developed using sound and established software and system engineering techniques."**
- **Validation: "The process of determining the degree to which a model and its associated data are an *accurate representation of the real world* from the perspective of the intended uses of the model."**
- **Accreditation: "The official certification that a model, simulation, or federation of models and simulations and its associated data are *acceptable for use* for a specific purpose**

Key DOD and SECNAV M&S Guidance

Department of Defense

INSTRUCTION

NUMBER 5000.61

…DoD Components shall:

Establish VV&A policies, procedures, and guidelines for M&S applications and their associated data.

….29 Apr 96

Department of Defense

DIRECTIVE

NUMBER 5000.59

…DoD Components shall:

a. Assist, as appropriate and able within their resource constraints, in the development, revision, and budget execution of the DoD MSMP and MSIP.

…. 20 Jan 98, w/Change 1

Secretary of the Navy

INSTRUCTION

NUMBER 5200.38

…Department of the Navy Modeling and Simulation Program guidance amplifies other existing regulations which govern the design, development, application and disposition of software, including modeling and simulation applications.

…. 18 Oct 94

Secretary of the Navy

INSTRUCTION

NUMBER 5000.2B

Purpose. To issue mandatory procedures for Department of the Navy (DON) implementation of… major and non-major defense acquisition programs and major and non-major information technology (IT) acquisition programs.

….06 Dec 96 (Under Revision)

SECNAVINST 5200.40 dtd 19Apr 99

- Establishes VV&A Policy
  - All M&S within scope shall be verified, validated, and accredited prior to use
  - Any subsequent use in a new application domain or modification of the M&S requires a re-accreditation
  - DON M&S VV&A process is flexible
- Assigns VV&A Responsibilities
  - Commanders of systems of commands (SYSCOMs) Direct Reporting Program Managers (DRPMs) Program Managers (PMs)
    - Accredit, in accordance with the instruction, models and simulations they employ as tools in meeting their assigned responsibilities
  - MCOTEA
    - Accredit all models and simulations used to supplement OT&E

MCOTEA Leverages Acquisition Products and Developmental Testing (DT)

- **MCCDC, HQMC C4, HQMC I&L and others establish requirements for materiel solutions**
  - **Up front coordination is required**
- **MCSC develops the materiel solution**
  - **PMs manage the "Acquisition Process" to confirm requirements are satisfied in development and during Developmental Testing (DT)**
- **MCOTEA tests to confirm the materiel solution is operationally effective (OE) and suitable (OS)**
  - **MCOTEA may leverage data provided as part of the development process and DT**
- **MCOTEA uses the TEMP TIWG to identify and allocate testing and data requirements**
  - ***Scope of Test Letter:* documents data requirements**
- **Leveraging development and DT**
  - **Minimizes cost and contributes to timely fielding of secure, interoperable systems**

Example: Interoperability Testing and the SIE

- CJCSI 6212.01B (08 May 00)
  - Mandates Joint Interoperability
- SECNAVINST 5000.2B: Section 3.4.2.1
  - Directs Systems Commands to conduct Interoperability Testing
- MCOTEA must evaluate Interoperability as part of the OT Process
  - Cost, Schedule and Asset Availability always constrain MCOTEA's ability to conduct testing
    - Goal is to leverage MCSC Interoperability Testing
- MCSC has developed the SIE as a tool to support Interoperability Testing as part of DT
  - MCOTEA sees the SIE as a potential valuable resource to support OT&E
  - The SIE is a "Simulation Environment"
    - And must be V&V'ed!

MCOTEA Concerns

- Scope of Test letter identifies areas where we want to leverage the development and DT process
  - If we do not receive that data supporting criteria may not be evaluated or evaluated as “Not Met”
    - MDA and Operating Forces assume risk

      Lack of DT Data recently affected two programs

      M&S was VV&A lacking in one case!
- MCSC has mandated use of the SIE to support Interoperability Testing
  - Test Planning is underway for several programs
- SIE has not been V&V’ed
  - SIE must be accredited to support PM, JITC and MCOTEA
  - OSD Oversight creates significant challenges for the AAAV Program

Notional SIE VV&A Roles and Responsibilities

- M&S Users: MARCORSYSCOM PMs and MCOTEA OTPOs
- M&S Proponent: Director MCTSSA
- M&S Accreditation Authority
  - Deputy Commander MCSC C4I (DT&E)
  - Director MCOTEA (OT&E)
- Accreditation Agents
  - MCSC C4I or designee
  - MCOTEA or designee
- V&V Agent: SE&I SD
  - Responsibilities include:
    - Plan, manage, conduct, and document the V&V of the M&S.
    - Coordinate with the M&S User, proponent, developer, Accreditation Authority, Accreditation Agent and SMEs

Suggested Actions

- Convene an SIE VV&A working group
  - Representatives from MCCDC, MCSC C4I, MCOTEA, PGDs and MCTSSA
- Develop a POA&M for SIE V&V
  - ASAP
- Execute POA&M against SIE
  - SIE as configured to support COC will establish a baseline
    - Need date is Oct 03
  - Can be leveraged to support AAAV
    - Need date is Oct 04
- VV&A is an ongoing process
  - Must be institutionalized as part of SIE configuration control!

Backups

From MCTSSA: The Systems Integration Environment

- ***Notional*** **MAGTF C4ISR command and control architecture**
- ***Replicates*** **elements of the MAGTF**
- ***Employs a mix*** **of developmental, fielded and commercial C4ISR systems**
- ***Instrumented*** **with non-intrusive out-of-band diagnostic**

MEF CE

SIE

GCE

ACE

MEU AFLOAT (FY-03)

CSSE (FY-03)

From MCTSSA: SIE Mission Profile

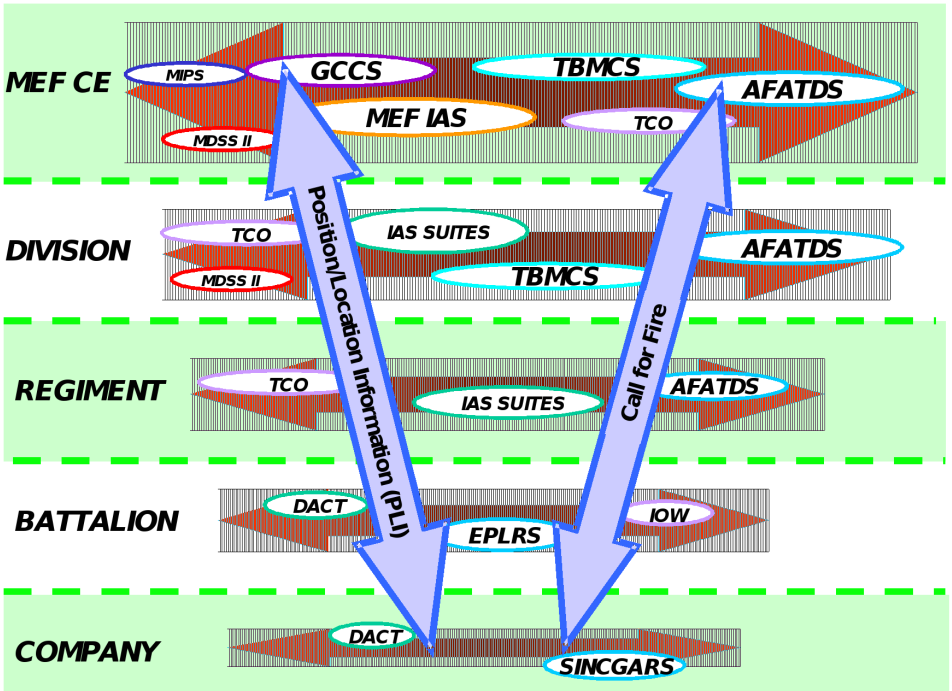
Accessibility
- MAGTF C4ISR Systems
- T-1 JITC
- ATM JDEP
- C2 S&T Initiatives

Security
- SIPRNET
- Physical Access
- Certification & Accreditation

Type of Use
- *Interoperability Assessments*
- *DT/OT support*
- Project Evaluation Testing
- Operating Forces Integration

Multiple Simultaneous Users
- SE&I Interoperability Assessments
- PM / Project Level (UOC/CAC2S)
- JITC Certification Testing
- JDEP
- C4I Help Test Trouble Resolution
- ONR C2 S&T Evaluations
- Other services

Vertical and Horizontal Threads



M&S Proponent

- Develop V&V plan and ensure accreditation authority accredits prior to use
- Implement V&V plan and forward plan, reports, and accreditation to DON M&S repository
- Prepare V&V report and forward to accreditation authority
- Ensure effective configuration management

M&S Accreditation Authority

- **Determine the appropriateness of the application of a M&S for a particular use**
- **Ensure adequate V&V procedures have been implemented prior to the use of M&S**